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(54) Integrated vehicle voice enhancement system and hands-free cellular telephone system

(57) An integrated vehicle voice enhancement system and hands-free cellular telephone system implements microphone steering techniques and noise reduction filtering to improve the intelligibility and clarity of transmitted signals. A microphone steering switch is provided for the cellular telephone interface which allows only one of the microphones to be switched in to an "on" state at any given time. The microphone steering switch generates a raw telephone input switch that is a combination of 100% of the designated primary microphone signal and approximately 20% of the microphone signals from microphones in the "off" state. In this manner, the telephone line does not appear dead to a listener on the other end of the telephone line when speech is not present in the telephone input signal. A noise reduction filter filters the raw telephone signal in the time domain in real time to improve the clarity of the telephone input signal when speech is present in the telephone input signal. A microphone steering switch for the voice enhancement system is also provided to implement switching between acoustically coupled microphones located within the vehicle.

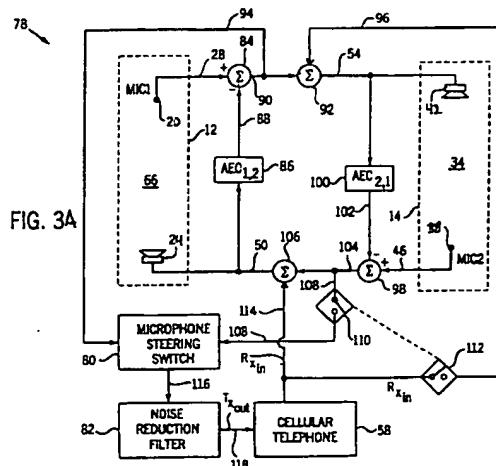


FIG. 3A



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## EUROPEAN SEARCH REPORT

Application Number

EP 99 30 0462

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
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A	EP 0 789 476 A (TEXAS INSTRUMENTS INC) 13 August 1997 (1997-08-13) * the whole document *	1-16	
Y	---	24	
A	US 5 259 035 A (PETERS RICHARD W ET AL) 2 November 1993 (1993-11-02) * abstract *	1,33	
Y	---	24	
A	US 5 574 824 A (SLYH RAYMOND E ET AL) 12 November 1996 (1996-11-12) * column 9, line 25 - line 68; figure 3 *	24	
A	WO 97 34290 A (ERICSSON GE MOBILE INC) 18 September 1997 (1997-09-18) * page 1, line 5 - line 19 * * page 11, line 14 - page 12, line 2; figure 3 *	24	
A	EP 0 640 953 A (CANON KK) 1 March 1995 (1995-03-01) * page 5, column 8, line 48 - page 6, column 10, line 15; figures 1-4 *	33	TECHNICAL FIELDS SEARCHED (Int.Cl.6)
A	PATENT ABSTRACTS OF JAPAN vol. 017, no. 470 (E-1422), 26 August 1993 (1993-08-26) & JP 05 111020 A (MATSUSHITA ELECTRIC IND CO LTD), 30 April 1993 (1993-04-30) * abstract *	33	G10L H04M G10K H04R
<p>The present search report has been drawn up for all claims</p>			
Place of search	Date of completion of the search	Examiner	
THE HAGUE	19 January 2000	Wanzeele, R	
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

**CLAIMS INCURRING FEES**

The present European patent application comprised at the time of filing more than ten claims.

Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):

No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

**LACK OF UNITY OF INVENTION**

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:



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**LACK OF UNITY OF INVENTION**  
**SHEET B**

Application Number  
EP 99 30 0462

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claims: 1-23

Near-end and far-end echo cancelling, microphone steering and noise reduction filtering of echo-cancelled signals for voice enhancement.

2. Claims: 24-32

Noise reduction filtering of background vehicle noise

3. Claims: 33-37

Voice activated switching

ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.

EP 99 30 0462

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

19-01-2000

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